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COMPLETE SPECIFICATION

Hearing Aid

We, HELMUT KOHLER and HERMANN MAY, trading as "VIENNATONE, HORGERATE" ING KOHLER AND ING MAY OFFENE HANDELS-GESELLSCHAFT, both Austrian Subjects, of Franz Josefs Kai 3, Vienna I, Austria, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

Persons who are deaf or hard of hearing tend to conceal their ailment from other people, and it is for this reason that the object in the construction of hearing aids for the deaf is that such persons should be able to wear these appliances in an inconspicuous manner. The advances produced in this respect by the introduction of transistors into the amplifying technique are quite important, but still leave much to be desired.

As an outcome of attempts to obtain a method of wearing a hearing aid so as to be as far as possible invisible, combinations of spectacles and hearing aids have been provided. Such arrangements can, however, scarcely be considered for people with normal vision. Furthermore, hearing aids have become known which take the form of a clip to be worn under or on the hair: these appliances are unsuitable for men.

The hearing aid constructed in accordance with the invention is characterised *inter alia* in that it can be worn so as to be substantially invisible, without a special hair style, spectacles or the like being necessary for this purpose.

According to the present invention there is provided a hearing aid, characterised in that it consists of a receiver disposed in the external ear or auricle and an amplifier with microphone which is to be worn behind the auricle and has a housing shape adapted to the space in which it is to be fitted, the said two parts being united by a resilient connecting member. This connecting element is preferably a resilient bowed member, which

extends upwardly from the front of the auricle, over the highest point of attachment of the latter and to the hearing aid housing, which is arranged in the space between the auricle and the petreous portion of the temporal bone, this bowed member being made as a supporting element which can be individually adapted to the wearer. According to a further feature of the invention, the said housing is provided with plastic surface layers which are subsequently modelled thereon and which, made in the same colour as the skin, further reduce the obviousness of the hearing aid and ensure a good seating thereof.

As a result of these measures, a number of advantages are produced: even when using a conventional microphone, the hearing aid shows a low tendency to acoustic feed-back, because the auricle is disposed between the microphone and the receiver. The audible impression is largely natural, because the sound is received at that point which corresponds to the reception of sound with normal hearing, i.e. the point which is effective with unweakened hearing power. The possibility of using the telephone is fully maintained and the hearing aid can be constructed in a standard form for men and women.

An embodiment of the invention will now be described by way of example with reference to the accompanying drawings, in which

Fig. 1 shows the complete appliance in front elevation,

Fig. 2 is a side elevation thereof,

Fig. 3 is a front elevation of the human outer ear fitted with the hearing aid and,

Fig. 4 shows the fitted hearing aid in rear elevation.

The hearing aid comprises a flat, cylinder-like housing 1 of height H, having an approximately kidney-shaped cross-section, and including a kidney-shaped end face 2. Such a member is already adapted to the anatomy of the part of the head concerned, even if

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only to a rough extent, and can be fitted satisfactorily in the space between the rear of the auricle and the petreous portion of the temporal bone (hereinafter referred to briefly as "temporal bone"). This housing can be in two parts and consist of moulded material; after fitting the amplifier (not shown) and the microphone, the two halves of the housing are for example adhesively connected. The battery 3 is inserted through a slot 4 and held inside the appliance by means of contact springs (also not shown) or in any other manner. Openings 5 can be provided for improving the sound reception. No control means are needed so that further openings in the housing are superfluous; nevertheless, they can also be provided. For individually adapting the housing to the place where it is to be fitted, there are provided moulded surface layers 6, 7, consisting for example of acrylate which polymerises in the colour of the skin.

The use of a single housing for all hearing aids is a technical advantage from the production point of view, in that this is an important basis for economical manufacture.

The ear-piece 8 is connected through a resilient bowed member 9 to the housing 1. This bowed member contains the conductors between the amplifier and receiver and is sufficiently flexible to avoid pinching the ear and to facilitate convenient attachment and removal of the hearing aid, but on the other hand it should retain its shape to a sufficient degree in order to support the housing 1 reliably in the place where it is fitted. The bowed member is adapted once and for all to the individual requirements of the wearer according to height *a* (Figure 3) and curvature, this being effected by emphasising the necessary permanent deformation or shortening the bowed member. Such a bowed member can for example consist of two wires of hard brass, hard bronze or another similarly behaving material having good electrically conducting properties, the said material being covered with an insulation consisting of a material which is the colour of the skin.

Figures 3 and 4 show how the hearing aid, in accordance with the preferred method of wearing which has just been described, is hung in the depression 10 which exists between the auricle and the adjacent parts of the head. The fact that the bowed member, provided that it is sufficiently strong, presses the housing of the hearing aid firmly against the back of the auricle and the temporal bone, ensures that the said housing is reliably held in the fitting space and thus the appliance becomes largely invisible, especially when the housing has been provided with the moulding which has been described. It will of course usually not be desired to forego the advantages provided by the moulding for adapting the housing.

The individual adjustment of the hearing aid according to the invention is effected as a whole in the following manner:

(a) Electrically, by means of an audiogram, in a manner which is known;

(b) by moulding the ear-piece to the shape required;

(c) by adaptation of the connecting bowed member as regards shape and length, and

(d) by moulding the surfacing layers of the housing.

The drawing shows a preferred but not in any way the exclusive constructional form of the device according to the invention. In order to avoid as far as possible the use of visible conductors, it has already been proposed that the receiver should be considerably reduced in size and inserted into the auditory duct, the connecting conductor being passed rearwardly through a hole made by surgical methods in the auricle. Without wishing to discuss the expediency of this method of procedure, it is to be established that this disposition of the conductor is also possible in the present case, the said conductor becoming a connecting member holding the two hearing aid parts 1 and 8 together and the separability would be produced by using plug and socket connections.

Finally, it is to be pointed out that the hearing aid according to the invention can also be used satisfactorily by persons who wear spectacles. In this case, the supporting bowed member 9 can be so united with the side arm of the pair of spectacles that the former hangs on the latter, or the housing accommodating the amplifier and the microphone is connected to the side arm of the spectacles, it being possible for example to effect this by the said side arm being drawn through an eye in the said housing. In contrast to the "hearing aid spectacles" referred to above, this has the advantage that it is possible to use ordinary, commercially available spectacles; in an extreme case, it will be sufficient for one of the side arms of the spectacles to be slightly modified in order to design it as a supporting member of the type just referred to. In any case, this arrangement avoids the particularly difficult adaptation of the spectacle frame to the shape of the head of the wearer and the fitting of a hearing device in the special spectacle frame, as is necessary with "hearing aid spectacles." In the event of the hearing aid being combined with a pair of spectacles, the housing of the hearing aid replaces the known downwardly curved end of the spectacle side arm, which assures that the spectacles are well supported by bearing on the temporal bone. Such a form of housing is shown in Figure 1 at 11, with the end 12 of the spectacle arm.

What we claim is:—

1. Hearing aid, characterised in that it consists of a receiver disposed in the external

- ear or auricle and an amplifier with microphone which is to be worn behind the auricle and has a housing shape adapted to the space in which it is to be fitted, the said two parts
5 being united by a resilient connecting member.
2. Hearing aid according to Claim 1, characterised in that the resilient connecting member is in the form of a bow and extends
10 in such manner that the hearing aid can be suspended thereon at the ear and that it simultaneously provides the electrical connection between the receiver and the amplifier.
- 15 3. Hearing aid according to Claim 1 or 2, characterised in that the supporting bowed member consists of a material which, while ensuring permanent elasticity, also permits permanent deformation for the purpose of
20 adapting the appliance to the anatomical requirements of the individual wearer.
4. Hearing aid according to Claim 1 or 2, characterised in that the amplifier and the microphone preferably forming a common
25 component therewith are arranged in a housing which comprises a subsequently applied covering of plastic material adapted to the space available between the ear and the temporal bone.
5. Hearing aid according to one of Claims
30 1 to 4, characterised in that it is suspended either with its supporting bowed member or with the amplifier housing on the side arm of a pair of spectacles, which parts of the hearing aid can also form a unit with the said side
35 arm.
6. A hearing aid substantially as hereinbefore described with reference to the accompanying drawings.

REDDIE & GROSE,

Agents for the Applicants,

6, Bream's Buildings, London, E.C.4.

This drawing is a reproduction of
the Original on a reduced scale.

